The Illinois Mathematics and Science Academy
A Pioneering Educational Community

Systems for Partnership Initiatives
Marcelline Barron
Director for Integrative Teaching and Learning Initiatives

TO: Members of the IMSA Community

SUBJECT: Presentation Day Sessions

DATE: April 25, 1994

On **Wednesday, April 27th, (EX Day)**, the Academy will once again showcase the research and other creative activities that we as a pioneering community do both here and off campus at the ***Sixth Annual Presentation Day***. Many of the students have been working for two years on their research and I know that they would appreciate your attendance at their sessions.

The sessions are twenty minutes in length, using the last five for questions. These concurrent presentations begin at 8:30 a.m. and will be using thirteen different sites throughout the building.

I hope that you will be able to attend some of the Presentation Day sessions. Thank you for all the various ways that you support our students.

ILLINOIS MATHEMATICS AND SCIENCE ACADEMY

"A Pioneering Educational Community"

SIXTH ANNUAL IMSA PRESENTATION DAY

APRIL 27, 1994

Lecture Hall

Session 1	8:30 - 8:50	WWW AND RELATED APPLICATIONS IN AN APPLIED PHYSICS ENVIRONMENT Jay Budzik, Marc Mengel, Jonathan Streets, Matt Wicks
	8:55 - 9:15	INVESTIGATION OF A POSSIBLE DISCREPANCY BETWEEN APPARENT AND PREDICTED RATES OF COSMIC RAY EVENTS IN THE FERMILAB CDF DETECTOR Neil Rubin, Drasko Jovanovic
	9:20 - 9:40	INTERACTIVE VIDEO TUTORIAL ON A PERSONAL COMPUTER George W. Su
Session 2	9:45 - 10:05	BABY YOU CAN DRIVE MY CAR: A LOOK AT SAFETY, ENGINEERING, AND MARKETING IN THE AUTOMOBILE'S PAST, PRESENT, AND FUTURE Joseph R. Prieto, Marcia S. Hayes, Sarah J. Pierce
	10:10 - 10:30	PREDICTIONS CONCERNING DIGITAL COMMUNICATIONS AND NETWORKING: THE FUTURE OF THE INTERNET Eric W. Gustafson
	10:35 - 10:55	IMPLEMENTATION OF A TRUE VIEWPATHING MECHANISM FOR THE BUILD PROCESS Elise Sivilay, Jo Anne Miller, Mike Dillenburg, Scott Danielson

A110

Session 1	8:30 - 8:50	THE CORONARY ATHEROSCLEROSIS AND PSYCHOLOGICAL STRESS (CAPS) STUDY Marybeth Antone, Joseph F. Arias, Vincent J. Bufaline, Rajesh N. Keswani
	8:55 - 9:15	A SURVEY OF CURRENT KNOWLEDGE CONCERNING KERATOCONUS, A DEGENERATIVE CORNEAL CONDITION Robert Grohe, Masum Momaya
	9:20 - 9:40	MULTIPLE SCLEROSIS: WHAT CAUSES IRREVERSIBLE DEMYELINATION? Sonali Bhatt, Young Chang, Andrea Stoler, Mauro Dal Canto

Session 2	9:45 - 10:05	CORRELATION OF ASYMMETRIC BRAIN BLOOD FLOW PATTERNS WITH THE HUMAN ELECTROENCEPHALOGRAM USING NONLINEAR ANALYSES Rani Ganesan, Walter Tang, Lukasz M. Konopka, Charles L. Webber, Jr.
	10:10 - 10:30	ANTILIPOPROTEIN ANTIBODIES IN PATIENTS WITH SYSTEMIC LUPUS ERYTHEMATOSUS Toshio Kimura, Milenko Lavarevic, John Skosey
	10:35 - 10:55	LOPOFUSCIN AROUND THE BLOOD VESSELS OF THE WHITE MATTER OF THE LEFT FRONTAL LOBE OF THE BRAIN AND ITS CORRELATION WITH AILMENTS Karen Meiye Wu, Mark Reyes, Soroja Ilangovan

A113

Session 1	8:30 - 8:50	SPECIFIC INHIBITION OF THE IMMUNE SYSTEM WITH ECDI--A POTENTIAL INHIBITOR OF TRANSPLANT REJECTION AND WHICH MAY NOT REDUCE RESISTANCE TO PATHOGENS Donald Elmore, Imran Hirani, Roger Melvold
	8:55 - 9:15	INVESTIGATIONS OF BIOMECHANICS OF THE RECTUS FEMORIS MUSCLE AFTER TRANSFER SURGERY Scott Riewald, Patty Sun
	9:20 - 9:40	JAPANESE EDUCATIONAL PHILOSOPHY AND ITS RELATIONSHIP TO STUDENTS' SUCCESS IN MATHEMATICS Stephanie Liang, Justin May
Session 2	9:45 - 10:05	INVESTIGATION OF MOLECULAR MECHANISMS OF NEUROBLASTOMA DIFFERENTIATION Rachel J. Burrell, Anita Prasad, Susan Cohn
	10:10 - 10:30	AN INDIRECT MECHANISM INDICATED FOR DEXAMETHASONE-INDUCED MYOCTE "HYPERTROPHY" Manu Gujrati, Scott S. MacGilvray
	10:35 - 10:55	THE EXPRESSION OF CELL ADHESION MOLECULES AS INDICATORS OF CARDIAC TRANSPLANT REJECTION Justus C. L. Morris, Tanya Reddick, Linda Piccinini

A116

Session 1	8:30 - 8:50	LOCATING MUTATIONS IN CORONAVIRUS POLYMERASE SEQUENCES THAT ARE RESPONSIBLE FOR ALTERING ENZYME FUNCTION Philip Suhan Huang
	8:55 - 9:15	GENETIC REGULATION OF IRON ASSIMILATION AND IRON TRANSPORT IN A SIDEROPHORE-METABOLIZING BACTERIUM Lynette L. Galloway, Domenic Castignetti
	9:20 - 9:40	COMPOSITIONAL DIFFERENCES OF THE PATHOGENESIS-RELATED PROTEINS, ß-ENDOGLUCANASE AND CHITINASE, BETWEEN RESISTANT AND SUSCEPTIBLE *Silene alba* IN RESPONSE TO THE PARASITIC SMUT FUNGUS *Ustilago violacea* AND THE RESPONSE PRODUCTION OF PATHOGENESIS-RELATED PROTEIN UPON EXPOSURE OF *Silene alba* TO DIFFERENT LIGHT SPECTRA Rebecca A. Reichert, Manfred Ruddat

Session 2	9:45 - 10:05	COCAINE HYDROCHLORIDE ADMINISTRERED TO PREGNANT RATS AFFECTS SEXUALLY DIMORPHIC BEHAVIOR OF OFFSPRING Tanya Reddick, Diane Sutor, Chris Hanousek
	10:10 - 10:30	PARENTAL BEHAVIOR IN CAPTIVE *Peromyscus polionotus* (BEACH MICE) Elizabeth R. Hetler, Sue Margulis
	10:35 - 10:55	MODEL BEHAVIOR MANIFESTED IN HIPPOCAMPUS-INDEPENDENT LEARNING SUBJECT TO EXPERIMENTAL VARIATIONS IN ALBINO RABBITS Visveshwar Baskaran, Piyush Gupta

A117

Session 1	8:30 - 8:50	DIFFERENTIAL ADHESION DOES NOT ACCOUNT FOR CELL GUIDANCE IN VITRO Samir Bangalore, Kevin Chu, Peter Fang, Kevin Healy, Philip Hockberger
	8:55 - 9:15	PEROXISOME PROLIFERATION AND HEPATOCARCINOGENESIS Janardan K. Reddy, Keith Alvares, Ateet H. Shah Ajay K. Reedy, Niccolo Della Penna
	9:20 - 9:40	SEARCHING FOR THE ORIGIN OF REPLICATION IN pVY105 of *Bacillus megaterium* QM B1551 Richard J. Hermes, Patricia Vary
Session 2	9:45 - 10:05	
	10:10 - 10:30	LACK OF SPECIFICITY IN RECOGNITION OF NUCLEAR LOCATION SEQUENCES BY RECEPTORS Stephen Adam, Shannon Hertzler, Irene Wu, Si-Yong Yi
	10:35 - 10:55	DNA FINGERPRINTING OF COMMERICAL CORN LINES USING RAPDs David Boctor, Rachel Kopay, Cathy Medich, Kim Self

A121

Session 1	8:30 - 8:50	SWIMMING KINEMATICS OF THE SCALLOP *Argopecten irradians* Mia Markey, Van T. Tang, Michael LaBarbera
	8:55 - 9:15	A 24-HOUR TELEMETRY STUDY IN MINNESOTA OF WOLF 423 OF THE PERCH LAKE PACK: ANALYSIS OF EVIDENCE FOR "DISPERSING" BEHAVIOR Brian Douglas, Margaret Lilly, John Thompson , Lori J. Schmidt
	9:20 - 9:40	EFFECTS OF VARIOUS NUTRIENT COMBINATIONS ON GROWTH OF TWO NATIVE WETLAND SEDGES, *Carex lasiocarpa* AND *Carex comosa* Deneb Bates, Catherine Reinke

Session 2	9:45 - 10:05	STRUCTURAL ANALYSIS OF AND TRAINING METHODS FOR NEURAL NETWORKS Ross Overbeek, James Hallick, Rahul Singhal
	10:10 - 10:30	DETECTING AND INTERPRETING "SPEECH" PATTERNS IN PHYSIOLOGICAL SYSTEMS Charles L. Webber, Jr.
	10:35 - 10:55	FLUCTUATIONS IN CYCLONE FREQUENCY ACROSS NORTH AMERICA David Changnon, James J. Noel, William Bullock

A149

Session 1	8:30 - 8:50	UNDER THE INFLUENCE: THE GERMAN IMPACT ON THE CHICAGO BEER INDUSTRY Roberta Anderson, Nathan Gettings, Amanda C. Kracen, Kristen Ufferman
	8:55 - 9:15	BIRDS OF A FEATHER FLOCK TOGETHER: PATTERNS OF KOREAN IMMIGRATION TO CHICAGO IN THE 1900s Philip Jun, Noah Kim, Christian Nokkentved
	9:20 - 9:40	GARFIELD FARM AND INN MUSEUM: THE LOCATION AND HISTORICAL SIGNIFICANCES OF ITS FORMER ROADS Eric Pierson
Session 2	9:45 - 10:05	SCHOOLS IN 1890s DU PAGE COUNTY, ILLINOIS Pat Walton, Jim Faletti
	10:10 - 10:30	SYNTHESIZING PHOTOGRAPHY AND CREATIVE WRITING Donald Elmore
	10:35 - 10:55	TIMING OF FETAL LOSS OF MURINE MPS VII HOMOZYGOTES Colleen Storzek, Edward H. Birkenmeier

A150

Session 1	8:30 - 8:50	RESTORATION, FORM, AND THE IMPORTANCE OF PLASTER ORNAMENTATION IN THE SCHILLER BUILDING OF CHICAGO Faisal Hadi, Kathy Vajda, Inge Fiedler, Barbara Hall
	8:55 - 9:15	AN OCEAN APART: VISIONS OF WOMEN IN POST-WORLD WAR I BRITAIN AND POST-WORLD WAR II AMERICA Jenny Deller
	9:20 - 9:40	AN ASSAY, CONDUCTED WITH THE HELP OF ELEMENTARY SCHOOL STUDENTS, OF ENVIRONMENTAL LEAD IN RESIDENTIAL AREAS IN THE ROGERS PARK AREA OF CHICAGO James Randall, Elizabeth Liu, Alanah Fitch
Session 2	9:45 - 10:05	FEMALE GENITAL MUTILATION IN AFRICA: STRATEGIES FOR COMBATTING THE TRADITION Dinah Consuegra
	10:10 - 10:30	STUDY OF SUBTEEN AND TEEN CAREER INTERESTS AS CORRELATED WITH SOCIAL FACTORS, WORK EXPERIENCES, AND ACADEMIC ACHIEVEMENT Hanh Lam, Barbara Schneider
	10:35 - 10:55	AN EMPIRICAL STUDY OF THE SPLASH Beezer Moolji

A151

Session 1	8:30 - 8:50	INVESTIGATION OF THE EFFECTS OF RADIOACTIVE ^{32}P ON DNA Shailushi Baxi, Louis Chang, Linda Yasui
	8:55 - 9:15	USE OF RAPD MARKERS IN GENETIC MAPPING OF THE PEA PLANT, *Pisum sativum* Neil Polans, Neha Kamdar, Karen Kimball
	9:20 - 9:40	ALCOHOLIC MYOPATHY IN RELATION TO AGING AND MUSCLE PROTEIN SYNTHESIS Eric C. Mak, Robert D. Wurster, Irene R. Held
Session 2	9:45 - 10:05	LACK OF SYNERGISTIC EFFECTS OF ETHANOL AND MARIJUANA Harriet de Wit, Pamela Doty, Kristen Ufferman
	10:10 - 10:30	INTERLEUKIN 12 REGULATION IN ETHANOL-CONSUMING C57/BL6 MICE Omar A. Latif, Carl Waltenbaugh
	10:35 - 10:55	INVESTIGATIONS OF LEVELS OF mRNA, WHICH CODES FOR PHOSPHOFRUCTO KINASE (PFK), IN LABORATORY RATS AT DIFFERENT STAGES OF DEVELOPMENT George A. Dunaway, Yashanad Mhaskar, Kristen Needham, Cynthia Lam, Richard T. Lee, Amanda Veihman

A155

Session 1	8:30 - 8:50	IMSA EXPLORED THROUGH MULTI-MEDIA Eugene S. Shinn, Dawn E. Summers, Jeff Lu
	8:55 - 9:15	ANALYSIS OF COMMODITY MARKETS IN MAKING DECISIONS ABOUT OPTIONS ON FUTURES Michael DeHaven, Jason Golden
	9:20 - 9:40	A SEARCH FOR THE MOLECULES RESPONSIBLE FOR THE SYNAPTIC PLASTICITY IN LEARNING Josephine Aung, Peter Kim, Joseph R. Moskal
Session 2	9:45 - 10:05	INCLUSIONS IN METEORITES: INDICATORS OF EARLY SOLAR SYSTEM PROCESSES Amanda Leach, Steve Simon, Lawrence Grossman
	10:10 - 10:30	ERROR ANALYSIS OF GALACTIC MODELS Nsesa Kazadi, Timothy McKay
	10:35 - 10:55	ASCERTAINING REQUIREMENTS FOR PROJECTED REINTRODUCTION OF FOUR VERTEBRATE SPECIES INTO A WETLAND Roberta Anderson, Peggy Kim, Amanda Kracen, Eric Lee, Georganna Collins

Auditorium

Session 1	8:30 - 8:50	TRANSLATING VICTOR HUGO'S *LES MISÉRABLES*: IN TEXT AND SONG Peggy Kim, Willa Shultz
	8:55 - 9:15	MORRISSEY AND OSCAR: THESE CHARMING MEN Amanda C. Kracen, Kristen Ufferman
	9:20 - 9:40	GENDER INFLUENCES IN PHYSICS EDUCATION David T. Workman

Session 2	9:45 - 10:05	CONFORMITY OF KATHERINE MANSFIELD'S "PRELUDE" TO DuPLESSIS'S "ENDING THEORY" Cheri Long
	10:10 - 10:30	DEPICTIONS OF TWO SOCIAL PREDATORS (LIONS AND WOLVES) IN CHILDREN'S LITERATURE AS COMPARED WITH ACTUAL BEHAVIOR IN NATURE Elizabeth Darr, Neha Kamdar, John Thompson
	10:35 - 10:55	MACHIAVELLIAN PRINCIPLES IN SHAKESPEARE'S *HENRIAD* Michele Casey, Barbara Allen Taylor

Academic Pit

Session 1	8:30 - 8:50	AN ANALYSIS OF THE KABBALAH: JUDAIC MYSTICISM Jake Gerstein
	8:55 - 9:15	THE POTENTIAL OF COMPUTER ANIMATION Han Y. Kim, Pat J. Kutz
	9:20 - 9:40	USES FOR PROGRAM *AXIOM* IN AN UNDERGRADUATE ENVIRONMENT Noel Gres, Zachary Miller, Emily Schafer, Karl Knapp
Session 2	9:45 - 10:05	
	10:10 - 10:30	EXPLORING MATHEMATICAL RELATIONSHIPS IN A PARALLEL AXIS GRAPHING SYSTEM Charles L. Hamberg, Ashley L. Morgan
	10:35 - 10:55	VISUAL DECEPTION PERCEPTION IN MALES AND FEMALES Marcia S. Hayes, Rita L. Kingsbury, Kristen M. Ufferman

D110

Session 1	8:30 - 8:50	HISTORICAL INFERENCES BASED ON A TYPOLOGICAL ANALYSIS OF A PRE-MODERN CERAMIC ASSEMBLAGE FROM MADABA, JORDAN Annelise Li, Angela Thompson, Tim Harrison
	8:55 - 9:15	OPTIMIZATION, BASED ON STATISTICAL ANALYSIS, OF DIAL GOLD SOAP FORMULA Andrew Baptist, Andrew Cox, Joseph Liu, Winjie Tang, Amanda Veihman, Anne E. Coté, James Sybeldon
	9:20 - 9:40	EXPERIMENTS ON THE PHOTOCATALYTIC PURIFICATION OF WATER BY USE OF TITANIUM DIOXIDE IN A PROTOTYPE CONVERTER Dorothy Gray, Sylvia Moduthagam, Michael A. Wilson, Judith Schader
Session 2	9:45 - 10:05	COMPUTATIONAL ANALYSIS OF 2,2'-DISULFONIC STILBENES Linda Park, James Dix
	10:10 - 10:30	DETERMINING PREHISTORIC DIETS OF ANKYLOSAURS (ARMORED DINOSAURS) BY EXAMINING THEIR DENTAL MICROWEAR PATTERNS J. Michael Parrish, Jamie Jackson
	10:35 - 10:55	OPTIMIZATION OF AN OVERLOAD MECHANISM Christian Passow, Liza Aquino, Robert Petersen

Lunch

11:30 - 1 **All Mentors with their students please go to the Old Cafeteria area**

The Illinois Mathematics and Science Academy would like to express our gratitude to
the Mayer and Morris Kaplan Foundation
and
Imcera-Pitman-Moore
for their generous support of the Mentorship Program.

Attached abstracts are listed in alphabetical order by last name of first author

LACK OF SPECIFICITY IN RECOGNITION OF NUCLEAR LOCATION SEQUENCES BY RECEPTORS

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Si-Yong Yi, 7D13, Illinois Mathematics and Science Academy, 1500 West Sullivan Road, Aurora, Illinois 60506-1000, U.S.A. 708/907-5711 (phone)

The ease or possibility of import of a protein into a nucleus is regulated by which of the amino acid sequences called nuclear location sequences (NLSs) the protein possesses. Utilizing isolated nuclei engaged in protein import, we are attempting to find the specificity of binding of the T antigen NLS receptors that they possess. This is being accomplished by testing the ability of these NLS receptors to bind with different peptides and thereby import them. Nuclei were isolated by treating cells with the cardiac glycoside digitonin in an isotonic buffer–a procedure which breaks down the plasma membrane without breaking down the nuclear envelope or any of its contents. We added to the nuclei a known concentration of the peptide (SV 40 T antigen wild type) known to bind with the NLS receptor along with the naturally fluorescent protein allophycocyanin (APC). The APC attaches to peptides and thus the amount of fluorescence which develops in the nuclei is a measure of the amount of protein transport that has taken place through the nuclear pore complex. We then ran trials in which other, competing, APC-treated peptides were added to the nuclei. Our results showed that any of the peptides could be imported to some extent, indicating a lack of specificity of the receptor. However, the more competing peptide there was, the less fluorescence was observed in the nuclei, indicating less overall portein transport.

ASCERTAINING REQUIREMENTS FOR PROJECTED REINTRODUCTION OF FOUR VERTEBRATE SPECIES INTO A WETLAND

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Amanda Kracen, 2B10, Illinois Mathematics and Science Academy, Aurora, Illinois 60506-1000, U.S.A. 708/907-5229 (phone)
Eric Lee, 3B15, Illinois Mathematics and Science Academy, Aurora, Illinois 60506-1000, U.S.A. 708/907-5326 (phone)
Georganna Collins, Landscape Specialist, Wetlands Research, Inc., 53 W. Jackson Blvd. Chicago, Illinois 60604, U.S.A. 312/922-0777

Within the last century, the four wetlands animals in question have decreased dramatically in numbers, owing to habitat destruction. The Black-crowned Night-Heron, *Nycticorax nycticorax*; the Iron-colored Shiner, *Notropis chalybaeus*; the Illinois Mud Turtle, *Kinosternon flavescens spooneri*; and the River Otter, *Lutra canadensis*, are now on the Illinois Endangered Species list. We have reviewed what is now known about the conditions required by these animals. We are now comparing these known requirements with conditions at a wetland restoration site near Chicago. We will determine what alterations need to be made to the site in order to suit it to the needs of the four species. Suggested alterations include adding sand to the old quarry pit so the bottom will be more sandy and shallow (for the mud turtle), creating a shallow area at the side of a pond near a group of large trees with roosting platforms (for the night-heron), and creating a pile of wood near the bend of the Des Plaines River (for the otter).

UNDER THE INFLUENCE: THE GERMAN IMPACT ON THE CHICAGO BEER INDUSTRY

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We have produced a video depicting German immigration and its impact on Chicago, focusing on the development of the brewing industry. The physical geography of the Midwest drew German immigrants to Chicago to set up their breweries. The natural waterways, the fertile land, and the expanding metropolis were ideal for the making of beer. As more Germans were attracted to the city, a strong ethnic community took shape, enticing even more Germans to settle in Chicago. The brewing industry thrived in the city and the most prosperous brewers became community leaders. Technological advancements improved transportation, distribution, and storage techniques and these allowed larger brewers to control the market as smaller brewers were forced to close. Despite the collapse of their small breweries, the German community remained active and intact.

THE CORONARY ATHEROSCLEROSIS AND PSYCHOLOGICAL STRESS (CAPS) STUDY

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Vincent J. Bufaline, Edward Cardiovascular Institute, One ECI Plaza, 120 Spalding Drive, Suite 102, Naperville, Illinois 60540, U.S.A. 708/527-2730 (phone)
Rajesh N. Keswani, 3B14, Illinois Mathematics and Science Academy, 1500 West Sullivan Road, Aurora, Illinois 60506-1000, U.S.A. 708/907-5325 (phone)

We designed the protocol for the Coronary Atherosclerosis and Psychological Stress (CAPS) study in order to examine the relationship between cardiovascular disease and psychological stress. We will do this by administering the General Health Questionnaire (GHQ) and a physiological stress test. The physiological stress test is the collection of the physiological data of the patient using a computer interface known as the IQ system during a series of mental and physical stressors. We will administer both tests within two weeks of the patient's enrollment in a cardiovascular rehabilitation program, and repeat them two weeks prior to the completion of this program. There is also a possibility of a one-year follow-up study. By using both physiological and psychological research tools, we hope to establish a correlation between overreaction to stress and the development of coronary atherosclerosis.

A SEARCH FOR THE MOLECULES RESPONSIBLE FOR THE SYNAPTIC PLASTICITY IN LEARNING

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Joseph R. Moskal, The Chicago Institute for Neurosurgery and Neuroresearch, 428 West Demming Place, Chicago, Illinois 312/883-8585 (phone)

Synaptic plasticity in the brain is a critical part of information storage and is responsible for learning. In mammal brains, the hippocampus is one of the structures that has been implicated as being intimately involved in the associative learning process. We used eye blink conditioning in rabbits as a model for investigating hippocampal-dependent synaptic plasticity in learning. RNA from the hippocampus was isolated by standard methods and transferred to a membrane surface using the Northern blotting technique. The membrane was then probed with the cDNA for proteins thought to be involved in the learning process. To control for nonspecific changes, RNA from other brain regions and from pseudoconditioned rabbits was also isolated and analyzed. Changes in hippocampus between the conditioned and pseudoconditioned rabbits may indicate which specific molecules are directly involved in control of this learning process.

DIFFERENTIAL ADHESION DOES NOT ACCOUNT FOR CELL GUIDANCE IN VITRO

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Kevin Healy, Department of Biomaterials, Northwestern University Medical School, 303 East Superior, Chicago, Illinois 60611, U.S.A. 312/508-4735 (phone)
Philip Hockberger, Department of Physiology, Northwestern University Medical School, 303 East Superior, Chicago, Illinois 60611, U.S.A. 312/508-5625 (phone)

Cell migration is important in inflammation, in wound healing, in morphogenesis, and in metastasis of cancer cells. It has been hypothesized that cells are "directed" along chemical pathways by differential adhesion to extracelullar matrix molecules (*e.g.*, laminin, fibronectin, collagen). We have tested this hypothesis by growing mouse neuroblastoma cells and human osteoblast cells on microfabricated surfaces and examining their adhesivity using interference reflection microscopy (IRM) and radial flow assay (RFA). Glass surfaces were modified using silane-coupling chemistry and photolithography to form narrow pathways of amines, alkanes, and/or proteins. Previous results obtained by Healy and Hockberger have indicated that mouse neuroblastoma cells accumulate on certain surfaces more than on others (laminin > amine > alkane), although there was no clear correlation between tendency to accumulate and adhesivity. We are examining whether these results are applicable to other cell types as well as on other matrix molecules.

OPTIMIZATION, BASED ON STATISTICAL ANALYSIS, OF DIAL GOLD SOAP FORMULA

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Anne E. Coté, Dial Corporation, 2000 Aucutt Road, Montgomery, Illinois 60538, U.S.A. 708/801-4686 (phone)
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In order to determine the optimum formula for Dial Gold soap, we varied amounts of glycerin, moisture, and bottoms in experimental batches. After each batch was produced, its washdown temperatures and the soap-related uptime were determined as indices of the quality of the soap formula. Based on statistical analysis of these variables, we determined the best formula, but the ingredients going into a bar of soap made according to this formula would cost the company more than a bar of the soap currently marketed. It was therefore necessary to determine whether the increase in productivity would offset the increased cost of the ingredients.

MODEL BEHAVIOR MANIFESTED IN HIPPOCAMPUS-INDEPENDENT LEARNING SUBJECT TO EXPERIMENTAL VARIATIONS IN ALBINO RABBITS

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One group of albino rabbits was given training using tone-airpuff conditioning. A 400ms-long tone was followed immediately by a 150ms airpuff. The airpuff resulted in a reliable eye blink (nictitating membrane) response. After a rabbit had been subjected to numerous trials, it exhibited the conditioned response of blinking after the tone began but before the airpuff. The eye blink responses of the learning curve were associated with firings in the hippocampus as revealed by cannular probes. A second group of rabbits was then subjected to a conditioning procedure in which a 400ms tone with a 150ms airpuff overlapped with the last 150ms of the tone. The rabbits rapidly came to display expected conditioned behavior, but without correlation with hippocampal firing. When these rabbits were then exposed to the first procedure described above, they failed to demonstrate any sort of trained response. We conclude that learning in the second group of rabbits was not hippocampus-dependent. This result has implications for reliable behavioral training.

EFFECTS OF VARIOUS NUTRIENT COMBINATIONS ON GROWTH OF TWO NATIVE WETLAND SEDGES, *Carex lasiocarpa* AND *Carex comosa*

Deneb Bates, 4A20, Illinois Mathematics and Science Academy, 1500 West Sullivan Road, Aurora, Illinois 60506-1000, U.S.A. 708/907-5443 (phone)
Catherine Reinke, 4A20, Illinois Mathematics and Science Academy, 1500 West Sullivan Road, Aurora, Illinois 60506-1000, U.S.A. 708/907-5443 (phone)

Certain soil nutrients are especially important to the growth of native wetland sedges. We are investigating the effects of six different nutrient combinations/concentrations on two species of native sedges, *Carex lasiocarpa* and *Carex comosa*. We are measuring the growth of these sedges in terms of stem count, average plant height, and calculated stem density. Supplementary means of assessment of growth include shades of stem color and average lateral expansion of the sedges.

INVESTIGATION OF THE EFFECTS OF RADIOACTIVE ^{32}P ON DNA

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In order to test the effects of radionuclides on DNA, two radioactive isotopes (^{125}I and ^{32}P) were used and their effects contrasted. The series of experiments done with ^{32}P is the control series because ^{125}I emits radiation of a lower energy which should cause more concentrated damage than ^{32}P. To test this hypothesis, we cut the M13mp18 plasmid of the *E. coli* bacterium with three endonucleases; EcoR1, Bgl2, and Bgl1; in order to obtain a DNA fragment of 200 base pairs. The fragment was then run on a low melting point agarose gel and extracted by phenol-chloroform extraction. The DNA was quantitated, end-labeled with either ^{125}I or ^{32}P, and run on a sequencing gel to observe any damage done to it. Results are currently being analyzed.

MULTIPLE SCLEROSIS: WHAT CAUSES IRREVERSIBLE DEMYELINATION?

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In multiple sclerosis, plaques of demyelination are formed in the central nervous system. Demyelination is the destruction of the myelin sheath surrounding nerve fibers. There is evidence of an inflammatory response which seems to be correlated with this destruction. The destruction seems to be due to the activation of macrophages, which may result from a viral stimulation or an autoimmune response. Mice strains infected with Theiler's virus are used as a model system for multiple sclerosis. The disease caused in these mice by Theiler's virus is similar to multiple sclerosis in humans. We are interested in learning why demyelination occurs and why remyelination occurs very inefficiently, if at all. We are using immunocytochemical procedures to identify specific myelin proteins taken from diseased mice. This is intended to help in the evaluation of myelin destruction and in correlating the in-vivo situation with a tissue culture model that is being developed.

DNA FINGERPRINTING OF COMMERCIAL CORN LINES USING RAPDs

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The processes of DNA extraction, PCR (polymerase chain reactions), electrophoresis, and isozyme analysis have become important tools for agriculture. Researchers use such techniques to identify, isolate, and alter strains of corn, wheat, soybeans, and other such commercial cash crops for seed suppliers. Cargill Hybrid Seeds employs all of these techniques in genetic analysis in order to isolate and improve upon their numerous lines of corn. We extracted DNA from 48 of these lines and used these DNAs to "fingerprint" and compare electrophoresis patterns among the different plants. We differentiated between the strains by using a process known as Random Amplified Polymorphic DNAs (RAPDs). We compiled the data (mostly in the form of computer-assisted analyses of electrophoresis gel images) and entered them into the NTSYS program. This computer program was designed to assist in creating a dendrogram to show genetic relationships (a family tree) to aid in making decisions concerning what crosses to make, etc.

WWW AND RELATED APPLICATIONS IN AN APPLIED PHYSICS ENVIRONMENT

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We used an SGI Workstation and standard UNIX tools to compile and build several libraries and programs, allowing users at Fermilab to access online multimedia information in effective ways. We added documents, support files, and administrator tools in order to complete the project and allow all Fermilab and Internet network users to have access to information about Fermilab, to the products supported, and to documentation on these products, all conveniently on their computer screen.

INVESTIGATION OF MOLECULAR MECHANISMS OF NEUROBLASTOMA DIFFERENTIATION

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Neuroblastoma (NB) is a pediatric cancer arising from undifferentiated neural crest cells. Patients with differentiated NB tumors have a better prognosis than those with undifferentiated tumors. Previous research has demonstrated that when NB cells are treated with retinoic acid (RA) in the laboratory, the cells differentiate into more mature neuronal cells *in vitro*, thus demonstrating the efficacy of RA to induce differentiation. Up-regulated cDNA clones were isolated by differential screening. We are searching for a novel gene or genes involved in the differentiation of NB cells. To identify genes that are important in NB differentiation, a cDNA library was prepared from NB cells treated with RA. The cDNA inserts are being sequenced to establish the identity of the up-regulated genes.

MACHIAVELLIAN PRINCIPLES IN SHAKESPEARE'S *HENRIAD*

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We studied Niccolo Machiavelli's *The Prince* along with *Richard II*; *Henry IV, Part One*; *Henry IV, Part Two*; and *Henry V*–the four books of Shakespeare's *Henriad*. We measured the behavior of Richard II and Henry V in the plays against Machiavelli's guidelines for rule. We found that Richard II, who followed a few Machiavellian guidelines, was unsuccessful. Henry V, who followed most but not all of the guidelines, was very successful. We discovered that the common people Henry V associated with in his youth taught him (by example) Machiavelli's principles. Henry learned about the Machiavellian idea of rejection through these people. His ability to reject his divine Right as a King allowed him to trust his subjects. Consequently, Henry was able to rule effectively without relying on the Divine Right of Kings.

FLUCTUATIONS IN CYCLONE FREQUENCY ACROSS NORTH AMERICA

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In order to determine potential causes for spatial or temporal fluctuations in various climatic elements across North America, we examined extratropical cyclones in a number of equal-area circles located in a grid that extended from 20° N to 70° N and from 60° W to 140° W. The period of study was 1950-1993. Our results indicate that the seasonal and annual frequency of cyclones decreased from the early 1950s to the mid 1980s. Since the mid 1980s, the number of cyclones has increased significantly. Similar long-term trends in both seasonal and annual cyclone counts indicate that features of atmospheric circulation influence the number of weather events similarly in all seasons. Additional investigation of the global ocean-climate system is required in order to ascertain the causes for the long-term trends.

FEMALE GENITAL MUTILATION IN AFRICA: STRATEGIES FOR COMBATTING THE TRADITION

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Female genital mutilation is an ancient custom in Africa and plays an important role in many African tribes. Some interrelated reasons why this practice continues are: tradition, religion, group acceptance, increase of matrimonial chances, preservation of virginity, and reduction of promiscuity. Female genital mutilation is arranged by a girl's family. Many of the girls are mutilated against their will. If they refuse, they are beaten or shunned. The mutilation event marks the passage from childhood to marriageable adulthood and the moment of entry into the full life of the community. Female genital mutilation is often performed with crude instruments and under unsanitary conditions that pose threats to health. I will discuss strategies I have come up with for ways of confronting African governments concerning this problem and for educating African women as to the dangers of this tradition.

DEPICTIONS OF TWO SOCIAL PREDATORS (LIONS AND WOLVES) IN CHILDREN'S LITERATURE AS COMPARED WITH ACTUAL BEHAVIOR IN NATURE

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We are analyzing the stereotypical portrayals of the lion and the wolf in selections of children's literature in various cultures. We are comparing the storybook images of these predators with their actual behavior in nature. Our resources include, but have not been limited to, children's fairy tales and stories, Native American myths and legends, Medieval accounts, education journals, the scientific literature, and various experts in the field. We have documented the existence of various standard misconceptions among various cultures. Examples of stereotypic misconceptions include the lion being thought of as "majestic" and easily fooled, and the wolf being thought of as especially agressive, cunning, mean, and vicious.

ANALYSIS OF COMMODITY MARKETS IN MAKING DECISIONS ABOUT OPTIONS ON FUTURES

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We utilized tenets of fundamental and technical analysis in order to produce sound financial decisions upon which future options could be traded. Option theory, market analysis, and psychological factors were all taken into account in predicting what would occur in the financial markets, and then trades were sought that would result in profit from the price movements. Owing to the speculative nature of the commodity markets, both "artistic" and scientific modes of interpretation are necessary for success. The majority of the trading recommendations we developed were actually utilized in trade in real markets, with real gains and losses of money.

AN OCEAN APART: VISIONS OF WOMEN IN POST-WORLD WAR II BRITAIN AND POST-WORLD WAR II AMERICA

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I have compared the female protagonists of post-World War II British novels authored by women and post-World War II American novels authored by women. The novels worked as a catalyst to transform an historical perspective into an ideological one. With the knowledge of each group's similar yet disparate war experiences, I was able to examine how women were shaped by the ideologies of post-World War II–in particular, the ideological justifications which were given for women to return to their traditional "homemaker" roles to make room in the workplace for men returning from the war. My studies led to my evaluating the evolution of gender roles, the effects of history and biology on the emotional and intellectual capacity of each gender, and my own experience as a women.

LACK OF SYNERGISTIC EFFECTS OF ETHANOL AND MARIJUANA

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We examined the interactions between drinking ethanol and smoking marijuana. Three volunteers participated in a six-session study. During the first session, subjects sampled non-THC placebo marijuana (PLMJ) and a moderate dose of marijuana (MJ) containing THC. During the second session, subjects sampled placebo ethanol (PLETH) and a moderate dose of ethanol (ETH). Cigarettes and glasses of beverage were color-coded to enable the subjects to identify the effects of each substance during the subsequent four sessions. In the last four sessions, subjects were tested under one of four conditions: ETH-MJ, PLETH-MJ, ETH-PLMJ, or PLETH-PLMJ. Subjects were told at the beginning of each session which color cigarette and which color glass of beverage were available that evening and were allowed to have as many cigarettes and glasses of beverage as they desired. When ETH and MJ were both available, the number of cigarettes requested was higher than when only marijuana was available. Under all conditions, the number of glasses of beverage requested decreased to between one and zero per hour over the three-hour period. MJ and ETH alone produced expected subjective effects that were not altered when taken in combination.

A 24-HOUR TELEMETRY STUDY IN MINNESOTA OF WOLF 423 OF THE PERCH LAKE PACK: ANALYSIS OF EVIDENCE FOR "DISPERSING" BEHAVIOR

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We, along with others, conducted a 24-hour telemetry study in Lake County, Minnesota, of wolf 423 of the Perch Lake pack. We utilized two tracking vans, directional antennae (stacked Yagi), a radio transmitter (collar), radio receivers, compasses, and maps in order to gather and record data on the location of the wolf. The wolf's location was calculated using simultaneous paired bearings every 15 minutes over a 24-hour period. In the course of our observations it began to appear that the wolf might be "dispersing." Indications for and against this interpretation will be discussed.

INVESTIGATIONS OF LEVELS OF mRNA, WHICH CODES FOR PHOSPHOFRUCTO KINASE (PFK), IN LABORATORY RATS AT DIFFERENT STAGES OF DEVELOPMENT

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Phosphofructo kinase (PFK) is the first rate-limiting enzyme in glycolysis. PFK has three subunits: L (the major form in the liver), M (the only form in adult skeletal muscle), and C (the major form in the brain). Each subunit is coded for by a gene on a different chromosome. We are investigating the levels of each subunit at different stages of development in various tissues of laboratory rats in order to determine whether the mRNA regulates the protein levels or if other factors are responsible. Our results indicate a relationship between the individual subunit mRNAs and the protein levels in each tissue in rat development.

SYNTHESIZING PHOTOGRAPHY AND CREATIVE WRITING

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This project was designed to explore possible connections between the creative processes employed in the visual and literary arts. I took several photographs of diverse subjects and these photographs were printed using standard darkroom techniques. Written responses were then produced from the examination of each photograph. Several of these responses were then collected and synthesized into a work of short fiction. I found that some themes were naturally preserved in the transition from photographs to short fiction. However, the literal details and exact impressions of the photographs had to be altered to create short fiction. The elements necessary to make an aesthetically pleasing photograph were different than the elements in effective short fiction.

SPECIFIC INHIBITION OF THE IMMUNE SYSTEM WITH ECDI–A POTENTIAL INHIBITOR OF TRANSPLANT REJECTION AND WHICH MAY NOT REDUCE RESISTANCE TO PATHOGENS

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T-lymphocytes (T cells) are activated against foreign antigens if the antigen is presented to the T cell by a macrophage cell and if the T cell receives a second chemical signal. Carbodiimide, specifically 1-ethyl 3 [3′ dimethyl aminopropyl] carbodiimide (ECDI), which has previously been used as a coupling agent for proteins, has been hypothesized to interrupt this second signal. T cells are inactivated when presented with an antigen in the absence of the second signal. This inhibition of the immune response against one specific antigen or set of antigens could prevent transplant rejection without compromising immune protection against harmful pathogens. Preliminary experiments show that injection of laboratory mice with ECDI-treated spleen cells from a genetically different strain of mice inhibits rejection of skin grafts from that foreign strain. Immune response against third-party grafts is not affected by the ECDI.

GENETIC REGULATION OF IRON ASSIMILATION AND IRON TRANSPORT IN A SIDEROPHORE-METABOLIZING BACTERIUM

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Bacteria utilize compounds called siderophores. Siderophores are ferric-ion chelating compounds, *i.e.*, compounds that make ambient iron available to the bacteria when they are iron deficient. A particular strain of the bacterium Deferrioxamine B Catabolizer 5 (DFBC 5) is unusual in that it degrades the siderophore Deferrioxamine B (DFB) for its carbon. The question therefore arises as to whether this bacterium regulates its siderophores in the same manner as other bacteria. Our initial investigation focused on determining if the strain in question ("strain #5") contains the ferric uptake regulator (*fur*) gene and an Iron Repressible Outer Membrane Protein (IROMP) gene. The experimental results indicate that "strain #5" either lacks a *fur* gene or possesses one significantly different from that of the *Pseudomonas* which supplied the DNA probe utilized.

CORRELATION OF ASYMMETRIC BRAIN BLOOD FLOW PATTERNS WITH THE HUMAN ELECTROENCEPHALOGRAM USING NONLINEAR ANALYSES

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Taking linear and nonlinear dynamics into account, we studied human EEG waveforms in order to better understand the effect disease had had on the blood flow in the brain. The EEG is a complex spatiotemporal average of multi-focal electrical signals which is characterized by signal drift and nonstationarities. We are looking at EEG waveforms from the temporal lobe sites t5 and t6, using linear spectral analysis (FFT) and nonlinear recurrence plot analysis (RPA). Owing to the subtle nature of the changes in brainwave patterns, linear analysis by means of analyzing raw data from EEGs of various diseased and control patients showed no changes. Though alterations were not obvious through linear plots, they are present and significant. By using multidimensional analysis/recurrence plots, these changes become obvious and evident. Experimental methods included human subjects tested for 15 minutes of EEG analysis and recorded at 200 Hz. The subjects were resting quietly and had their eyes closed during the test. In addition to EEG analysis, brain blood flow was mapped using a computer program. Results showed that with RPA analysis, differences in t5 and t6 were more common in the patient group than in the control. It seems that RPA analysis has shown its power in looking at the results of the human EEG.

AN ANALYSIS OF THE KABBALAH: JUDAIC MYSTICISM

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I conducted investigations of the Kabbalah, or tradition of mystical Judaism, using both translations of original material (Zohar, Torah) and works on the subject by rabbinical scholars. I reinterpret the Kabbalah's account of and explanations for the origin of the universe and its understandings of the nature of God into more modern modes of expression. The Zohar, found confusing to most readers because of its poetic nature, can in fact be analyzed to reveal a thoroughly developed and detailed theory of universal order. The impact of Kabbalisic belief and of Jewish life and law on each other is also explored in a religious and historical context. When Kabbalistic writings are examined in combination with the Mishnah (book of rabbinical law), then practical, secular reasons behind many of the Kabbalah's teachings are revealed. The symbolism of the Kabbalah, most notably, the Tree of Life, will be explained.

EXPERIMENTS ON THE PHOTOCATALYTIC PURIFICATION OF WATER BY USE OF TITANIUM DIOXIDE IN A PROTOTYPE CONVERTER

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Utilizing titanium dioxide, ultraviolet light, and oxygen in combination shows great promise in the treatment of contaminated water. Titanium dioxide has the unique ability to attract impurities under long-wave ultraviolet light. We designed and performed a series of experiments to determine, under varying conditions and in detail, the effects of TiO_2/ultraviolet light when phenol is used as the pollutant. The experiments were performed by means of a photocatalytic converter we designed and which we also regard as a prototype for apparatus to be used in water reclamation. The converter consisted of clear glass tubes under UV lights and contained water polluted with phenol and to which titanium dioxide had been added. The water had been aerated prior to its arrival in the tubes. Levels of phenol subsequent to treatment were ascertained by means of high-pressure liquid chromatography. The titanium dioxide bound with the phenol was then filtered out of the water. We are encouraged by the performance of our converter. It functioned well under natural sunlight on a sunny spring day.

USES FOR THE PROGRAM *AXIOM* IN AN UNDERGRADUATE ENVIRONMENT

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AXIOM is a program originally developed by IBM for use by professional mathematicians. However, *AXIOM* could also be used by undergraduates if curriculum were developed that incorporated it into their courses. As an example of *AXIOM*'s potential in curricula, we created a recursive program to solve equations using Newton's method. We then used this program to create graphs for determining the acceptable starting points. We also worked at finding the volume of the intersection of two cylinders at right angles. By graphing it, we were able to reduce the problem to a simple integral and then generalize it. In addition, we used *AXIOM*'s three-dimensional graphics to visualize Pascal's triangle, parametric motion, and solids of rotation.

A SURVEY OF CURRENT KNOWLEDGE CONCERNING KERATOCONUS, A DEGENERATIVE CORNEAL CONDITION

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Keratoconus is a degenerative corneal condition indicated by conical curvature and tissue thinning of the cornea. We have conducted a survey of American and foreign journal articles published from 1966 to the present and dealing with various topics concerning keratoconus. In particular, we gathered information dealing with the histopathological, biochemical, and biomechanical manifestations of keratoconus; genetic linkage to keratoconus; illnesses related to keratoconus; and surgical and other methods of treatment for keratoconus. We also consulted practicing physicians about unpublished information on the latest advancements in treatment of keratoconus patients. It appears that few conclusions have been reached about keratoconus and many discrepancies concerning what is agreed upon and supposedly known about keratoconus were discovered. As examples–some have stated that keratoconus is induced by hard contact lenses while others have stated that it is corrected by them; keratoconus has sometimes been called an autosomal dominant trait and at other times an autosomal recessive trait. Also, corneal transplants performed in the early stages of keratoconus have been judged beneficial to the patient by some, harmful by others.

AN INDIRECT MECHANISM INDICATED FOR DEXAMETHASONE-INDUCED MYOCYTE "HYPERTROPHY"

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The synthetic glucocorticoid dexamethasone is often prescribed to reduce oxygen requirements in premature infants placed on mechanical ventilators and supplemental oxygen. Recently, investigators have demonstrated that left ventricular hypertrophy develops in a significant number of these neonates. We used primary cultures of neonatal rat cardiac myocytes in order to determine whether dexamethasone produces hypertrophy by direct action on the cardiac myocytes. Isolated cells were grown at a density of 1.5×10^6 cells/35mm dish. Paired wells were maintained either in growth medium alone or with 10nM dexamethasone added. After 72 hours in the growth medium, the cells were harvested for analysis. Our data demonstrate that under these conditions dexamethasone does not induce myocyte "hypertrophy" in either spontaneously beating or contractile-arrested cells. We conclude that dexamethasone must induce hypertrophy by means of an indirect effect on the myocytes.

PREDICTIONS CONCERNING DIGITAL COMMUNICATIONS AND NETWORKING: THE FUTURE OF THE INTERNET

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Digital communications, *i.e.*, the ways in which computers can communicate, are becoming faster and more efficient, and "networking" is the buzz-word of the new information age. The Internet is now interconnected to span the globe. Soon, the Internet will come to just about every home in America, and electronic communication will become commonplace. I have concluded that commercial investors may try to take over the Internet, but that the universities and research institutes that are currently in control of the Internet would probably put up great resistance. I also predict that the Internet will soon enter the classrooms of pre-college students (K-12).

RESTORATION, FORM, AND THE IMPORTANCE OF PLASTER ORNAMENTATION IN THE SCHILLER BUILDING OF CHICAGO

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In 1961, the Garrick Theater of Chicago was demolished to accommodate construction of a new parking garage. The theater, originally named the Schiller Building, was designed and built during the period 1891-1892 by the two influential American architects Dankmar Adler (1844-1900) and Louis H. Sullivan (1856-1924). To lessen the consequences of the demolition of this architectural achievement, which had previously served as a combined theater and office tower, the Commission on Chicago Architectural Landmarks removed and distributed various fragments of the building to public institutions. As a result of this, the Architecture Department of the Art Institute of Chicago currently has in its collection a group of Sullivan's ornamental friezes taken from the Garrick. The friezes are cast plaster ornamentation from various parts of the building and had been painted and repainted over the years. Our project involves two of these friezes, each about 36" square–one taken from the Schiller's banquet hall and the other from its theater. We are attempting to establish the original color scheme for each of the friezes, inquire into their manufacturing techniques and those of the theater, and, if possible, also establish the original color scheme of the rooms the friezes adorned. We hope also, *en route*, to chance upon a better understanding of the architects' vision contained in our pieces and the theater as a whole.

EXPLORING MATHEMATICAL RELATIONSHIPS IN A PARALLEL AXIS GRAPHING SYSTEM

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In first year algebra courses, students graph "points," using a set of perpendicular axes called the Cartesian plane. It is interesting in 2-space to think of the axes as being parallel instead of perpendicular. In a parallel axis graphing system, an ordered pair is not graphed as a point, but rather as a line that connects the x and y coordinates on the axes. A parallel axis graphing system offers many opportunities to explore mathematical relationships. For example, parallel axes can be used in algebra to solve systems of equations. Parallel axes can also be used in calculus to discover information about the derivative of a function. Also, by overlaying a set of perpendicular axes on a parallel axes graph, we can discover relationships between parallel and perpendicular graphs. The real power of a parallel axis graphing system is when it is extended into higher dimensions. While it is very hard to visualize four mutually perpendicular axes, it is quite easy to visualize four parallel axes. If enough information can be discovered about the relationships between parallel and perpendicular axis graphing systems, parallel axes may revolutionize the visualization of higher dimensions.

VISUAL DECEPTION PERCEPTION IN MALES AND FEMALES

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Various statements have been made over the years to the effect that there are differences between the performances of males and females in dealing with spatial relationships. In order to investigate these claims, we have performed two experiments testing the possibility of differing visual perceptions and ability to cope with them in the two sexes. In the first experiment, using a "Necker Cube", we tested the depth perception and spatial relationship recognition among twenty-five IMSA males and twenty-five IMSA females. The second experiment utilized distorting goggles in order to ascertain the number of trials it would take for subjects to compensate for the alteration in their vision. In both experiments, we found that there is no statistically significant difference between the performance of males and females.

SEARCHING FOR THE ORIGIN OF REPLICATION IN pVY105 OF *Bacillus megaterium* QM B1551

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We are attempting to locate the origin of replication for pVY 105, an 8.1 kb plasmid in the wild type strain of *Bacillus megaterium* QM B1551. Using the restriction enzymes, we cut the plasmid into five pieces that could be tested separately for the origin of replication. To test for the origin, we ligated these fragments into pBEST, a plasmid with a neomycin resistance, an ampicillin resistance, and an origin of replication for *Escherichia coli*, and transformed them into *B. megaterium* PV 361. Because no *B. megaterium* transformants grew on selective neomycin media, none carried the *B. megaterium* origin needed to express Nm^r in the pBEST vector. However, only a small portion of the pooled DNA was used, and further avenues for experiment are being developed.

PARENTAL BEHAVIOR IN CAPTIVE *Peromyscus polionotus* (BEACH MICE)

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An observation period of ten minutes' duration was performed immediately on each family group of mice after the presence of a litter was first noted and also immediately after cotton nesting material was added (administered ten minutes after the initial discovery). The behaviors observed were then categorized and the percentage of time spent engaged in each behavior was calculated. These data were then graphed to show the relationship between the survival of litters and several key factors, including presence of the male along with the first and second litters and also inbreeding. Our results largely agree with previous studies, and most of the differences could be attributed to the small sample size in our study.

LOCATING MUTATIONS IN CORONAVIRUS POLYMERASE SEQUENCES THAT ARE RESPONSIBLE FOR ALTERING ENZYME FUNCTION

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Murine coronavirus, or mouse hepatitis virus (MHV), belongs to a family of RNA viruses called coronaviruses. I am studying a member of a series of temperature-sensitive (ts) viruses derived from the A59 strain of MHV in order to locate important functional regions of the murine coronavirus polymerase. Ts viruses are used to find essential functional regions of a protein by means of sequence comparisons because they possess induced mutations in some specific protein domain. These mutations result in changes of protein structure which make the protein nonfunctional at certain temperatures. This situation is known as a conditional phenotype. In the present study, although the virus is able to replicate at 33°C, it cannot do so at high temperatures, probably because the mutant protein is unable to fold correctly at high temperature. To locate a mutation conferring temperature-sensitivity, I compared the sequences of the wild type A59 strain and the ts mutant 450.1 (A59 strain) of MHV so as to ascertain differences that may enable the mutant to make RNA at 33°C but not at 39° C. Because the ts virus is unable to synthesize RNA at 39°, this implicates the RNA polymerase as the protein containing the mutation. Also, previous studies have mapped the mutation at the 5' end of the polymerase gene. For these reasons, sequences from the first 4 kilobases (kb) of wild type A59 strain and ts mutant 450.1 were compared and preliminary results reveal no mutations in any of the areas sequenced thus far. The eventual discovery of the location of the cause of the ts phenotype of this virus will help locate important functional regions of the polymerase protein.

BIRDS OF A FEATHER FLOCK TOGETHER: PATTERNS OF KOREAN IMMIGRATION TO CHICAGO IN THE 1900s

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In recent times, numbers of Koreans have migrated to the United States. It has been very difficult for many of these immigrants because of the various problems they have had in adapting to American culture. In our research, we have attempted to discover some of the primary sorts of problems encountered by these immigrants. We utilized census records housed at the Chicago Historical Society along with surveys which had been made by the *Chicago Korean Times* and conducted interviews of our own with Korean immigrants in order to reach our conclusions. We have found that one of the major Korean immigrant waves came during the Korean War, 1950-1953. This was a perilous time in Korea's history when Koreans were fighting Koreans. Many Korean immigrants came to Chicago. We have also noted several trends including a new migration from the city to the suburbs. From our interviews it seems that after getting comfortable financially, Koreans tended to move into the suburbs for a safer and calmer environment. Ther were always in search of a replacement for what they pictured as the long ago peaceful Korea. The main problems examined are Korean ethnocentrism and American prejudice.

ERROR ANALYSIS OF GALACTIC MODELS

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There are two main galactic models which predict star distribution on the galactic plane. The first is the Bachall model, which suggests that the stars should be distributed in three regions, a sphere, a thin disk, and a thick disk. The second model maintains that there is no thick disk but only a sphere and a thin disk. Utilizing data collected by telescope onto a CCD chip at the Yerkes Observatory in Wisconsin, we are determining the actual star-counts for certain regions of the sky. We are comparing the star-counts generated by the galactic models with the actual star-counts for statistical error analysis. This analysis can lead to choice of one model over another, or more specifically, answer the question: is there a thick disk?

THE POTENTIAL OF COMPUTER ANIMATION

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Since the advent of computer technology, graphics and animations have begun to play important roles in society. One such role is in entertainment. Using this technology, companies such as Sega and Nintendo have brought a whole new definition to home entertainment. An increasingly important role, however, is being exhibited in fields such as advertising, education, medicine, and law, which have utilized this technology to "show" concepts and ideas. This ability to "show" is well displayed in the movie *Jurassic Park*, which has astonished the world by bringing dinosaurs "back to life" using silicon graphics. We use computer-designed graphics and animations, some of which we have produced ourselves, and which contain features similar to those that have been used in advertising etc., in order to demonstrate that computers will be "king" of media by the turn of the century.

TRANSLATING VICTOR HUGO'S *LES MISÉRABLES*: IN TEXT AND SONG

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By means of a comparative analysis of the novel and the French and English musical renditions of Victor Hugo's *Les Misérables*, we have explored the substance of the story. We focus on one scene through parallels between the musical lyrics and the original text. A song, in the original French text, will be performed during the presentation. *La présentation va se concentrer sur les paroles et le texte du roman. On va regarder les problèmes qui existent quand on veut traduire du français à la langue anglaise. La présentation va être bilingue.*

ANTILIPOPROTEIN ANTIBODIES IN PATIENTS WITH SYSTEMIC LUPUS ERYTHEMATOSUS

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Artherosclerotic vascular disease such as stroke occurs frequently in systemic lupus erythematosus (SLE) patients. Among SLE patients, dyslipoproteinemia, characterized by increased concentrations of serum triglycerides and decreased levels of high density lipoprotein (HDL), was also a common trend. We studied the presence of aLA in 214 SLE patients. Antilipoprotein antibodies (determined by passive microhemaglutination) were found in 86 out of 214 patients. The titer of aLA was 1:4 in 15, 1:8 in 31, 1:16 in 27, 1:32 in 8, 1:64 in 4, and 1:256 in 1 patient. Further studies, conducted on 12 SLE patients, examined concentrations of triglyceride, total cholesterol, and HDL, LDL, and VLDL cholesterols. Although there were no statistical differences between patients with or without aLA, one patient with a high titer of aLA (1:256) had a very high concentration of triglyceride (442 mg/dl) and a remarkably low concentration of HDL cholesterol (37 mg/dl), suggesting that the presence of aLA could be the risk factor for vascular complications in SLE patients.

MORRISSEY AND OSCAR: THESE CHARMING MEN

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After listening to the music and scrutinizing the lyrics of Steven Patrick Morrissey and analyzing the literature of Oscar Wilde, definite similarities appeared. After reading biographies of both men, it was apparent that there were many commonalities in their experiences, such as their relationships with their parents, their opinions on women, and their fondness of fashion. They shared an appreciation of beauty, valued art, and had unique concepts of gender. Our findings will be presented in a "charming" and informal audio-visual medium and will deal with the art and lives of both men.

STUDY OF SUBTEEN AND TEEN CAREER INTERESTS AS CORRELATED WITH SOCIAL FACTORS, WORK EXPERIENCES, AND ACADEMIC ACHIEVEMENT

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We are conducting a five-year, longitudinal study of students in thirty-three schools. The students are in grades six, eight, ten, and eleven. Students are interviewed concerning their work experiences, their recreational interests and those of their friends, and their career interests. The students are also given a programmed watch that beeps at random intervals during standard waking hours (7:00 am-10:00 pm). Each time the watch beeps, the students are required to answer questions about what they are doing at the time of the beep. The students record these answers in special booklets ("ESM booklets") provided for this purpose. The students are asked to complete questionnaires ("NELS questionnaires") about their family history and give the names of their friends ("FRIENDS questionnaire"). All of the data are currently being analyzed to find correlations of the various factors with expressed career interests.

INTERLEUKIN 12 REGULATION IN ETHANOL-CONSUMING C57/BL6 MICE

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We are investigating the effects of ethanol on immune function and cytokine production. Th1 lymphocyte mediated immune function is more sensitive to modulation by alcohol than are Th2 mediated responses. Mice fed an ethanol-containing liquid diet show decreased amounts of the Th1-produced cytokine, interferon-γ (IFN-γ). Interleukin 12 appears to be necessary for both the production of Th1 and IFN-γ. IL-12 has a protein subunit of 35,000 daltons and another of 40,000 daltons. These are p35 and p40, respectively. The literature suggests that p40 mRNA is transcriptionally regulated. mRNA is isolated using poly dT cellulose, from which first strand cDNA is produced by reverse transcribing the mRNA using poly dT as primers. We used IL-12 specific oligo nucleotides to amplify IL-12 specific cDNA in a Polymerase Chain Reaction (PCR). Results of the PCR indicated the extent to which regulation of IL-12 cytokine mRNA in alcohol-consuming mice was taking place. Experiments optimized the PCR protocol for IL-12 using IL-12 cDNA specific primers. We have now begun to test for IL-12 mRNA in the spleen cells of C57BL/6 mice. Preliminary results suggest that IL-12 may be down-regulated in ethanol-consuming mice.

INCLUSIONS IN METEORITES: INDICATORS OF EARLY SOLAR SYSTEM PROCESSES

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The solar system is believed to have originated from a cloud of gas and dust, from which condensed the solid materials that now compose the planets and asteroids. The inclusions contained in carbonaceous chondrite meteorites are pockets of minerals which have survived with little alteration since the origin of the solar system. Some inclusions are made of the first minerals that formed from the gas cloud. We are giving particular attention to the rims of the inclusions, which exhibit a pattern of layering of minerals that is not well understood. By means of a scanning electron microscope and an energy dispersive x-ray system, we have taken high magnification photographs of several inclusions and have identified their minerals. The rims on these inclusions show textures and mineral compositions that are different from those of the host inclusions, which may indicate that the rims were formed by reaction with the gas cloud after the inclusions formed.

HISTORICAL INFERENCES BASED ON A TYPOLOGICAL ANALYSIS OF A PRE-MODERN CERAMIC ASSEMBLAGE FROM MADABA, JORDAN

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A survey of the archaeological remains of the urban core of ancient Madaba, Jordan, was conducted by one of us (Harrison) over a twelve-day period between March 27 and April 10, 1993. The purpose of the survey was to document the presently existing pre-modern archaeological remains of the town and to gain some sense of the occupational history of ancient Madaba. Among other discoveries was an assemblage of pottery found in a cave in the town. We used two types of typological analysis (descriptive and comparative) in order to obtain information about the larger context of the discovery. Through analysis of the pottery, its historical context became clear. The pottery dated to the sixth-seventh century A.D., or the Late Byzantine-Early Islamic transitional period. The nature of the assemblage suggests a number of observations about the history of ancient Madaba. In particular, it indicates that Madaba continued to thrive during and after the Islamic Conquest. It also suggests that the town may have been abandoned in the eighth century after a devastating earthquake.

JAPANESE EDUCATIONAL PHILOSOPHY AND ITS RELATIONSHIP TO STUDENTS' SUCCESS IN MATHEMATICS

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New explanations for Japanese success in mathematics have been developed by Shin-ying Lee, Harold W. Stevenson, and James W. Stigler on the basis of data gathered concerning mathematical achievement among Japanese first and fifth grade students and on American first and fifth grade students. We studied the current primary literature concerning teaching methods and social constructs in Japan and also interviewed scholars in the field. The information and insights we gained in these ways, taken in combination with mathematical test scores, clarify the factors which contribute to the success of Japanese students. We will discuss the origin and benefits of mastery learning and also discuss classroom philosophy and Japanese culture and how they all influence Japan's educational system so that we may explain why Japanese students succeed in mathematics. An understanding of this issue depends upon an appreciation of a variety of contributory synergistic factors rather than one or a very few.

CONFORMITY OF KATHERINE MANSFIELD'S "PRELUDE" TO DuPLESSIS'S "ENDING THEORY"

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I have analyzed the plot of Mansfield's short story "Prelude", from the standpoint of DuPlessis's theory of "writing beyond the ending," which concerns female-authored modernist fiction. "Prelude" exhibits support for DuPlessis's theory by breaking existing romance conventions, revealing women's taboo experiences, and offering *Bildung*, or quest, to a female character.

ALCOHOLIC MYOPATHY IN RELATION TO AGING AND MUSCLE PROTEIN SYNTHESIS

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The disease which afflicts the largest number of people in the United States is alcoholism. Complaints from patients who suffer from chronic alcoholism include muscle weakness and decrease in muscle mass. Both may be the result of a reduction in protein synthesis in addition to increased protein loss. We investigated the effects of ethanol on tissues of two specific muscles, the soleus and the extensor digitorum longus (EDL). The EDL is a fast-twitch muscle while the soleus is a slow-twitch muscle. We tested for differences in protein concentration by using electrophoresis and in muscle strength between muscle fibers of normal laboratory rats and alcoholic rats at various ages and durations of alcoholism. Muscle strengths were measured on anaesthetized rats by cutting muscles at their insertion, tying the cut ends to an oscilloscope hooked up to an averager and a plotter, and stimulating contractions electrically. Preliminary results will be discussed along with their implications.

SWIMMING KINEMATICS OF THE SCALLOP *Argopecten irradians*

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Although *Argopecten irradians* is a common and economically important mollusk of the East Coast, the mechanics of its escape behavior (swimming) have been largely ignored. We are attempting to quantify the scallops' swimming kinematics by determining clap frequency, initial and jet propulsion angles, acceleration, and velocity. Video and digitizing equipment help in analyzing and graphing data that are used in relating clap frequency to scallop size and velocity. The results will help to outline the process of scallop swimming so that more will be known about its evolution and the origins of its associated functional and morphological novelties. We intend to parallel the Dadswell and Weihs study of the scallop species *Placopecten magellanicus*. The relationships between velocity, clap frequency, and height in *Argopecten irradians* and analysis of these relationships for other species as given in the literature indicate that clap frequency is more strongly influenced by size than by the details of shell form.

AN EMPIRICAL STUDY OF THE SPLASH

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In order to determine laws that govern the properties of splashes of water in response to dropped objects, I dropped a marble from different heights into a bucket of water. A perforated horizontal sheet of paper was suspended over the lid as a detector of splashed water. As the marble was dropped through the hole in the paper, the paper was either hit or not hit by water. When the paper cover was hit 50% of the time that the marble was dropped from a given height, then I reasoned that the height at which the paper was placed was the height that the average splash would have reached had the paper not been there. This average splash height, along with the height from which the marble had been dropped, constituted one data point. The data seem to suggest that the height at which an object is dropped is proportional to the square of the average height of the splash, *i.e.*, $H_{object} = k\, H_{splash}^{2}$. This agrees with the observation that water does not splash nearly twice as high when one drops an object from twice the height.

THE EXPRESSION OF CELL ADHESION MOLECULES AS INDICATORS OF CARDIAC TRANSPLANT REJECTION

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Cytokines are local regulatory factors that affect the activities of cells and they are mediators of events involved in immune response, such as organ transplant rejection. Cytokines have been shown to regulate the expression of cell adhesion molecules, which control leukocyte migration during immune responses. We are investigating the expression of the cell adhesion molecules LFA-1, ICAM-1, VCAM-1, as well as selectins in Brown Norway-to-Lewis rat cardiac allograft *vs.* Lewis-to-Lewis isograft transplants. Using immunohistochemical techniques, we are measuring the *in situ* levels of these cell adhesion molecules during the first week posttransplant, by which time allograft rejection is complete. Our data appear to indicate an upregulation of all three adhesion molecules in the recipients of rat cardiac allografts, but not in the cardiac isografts. The long-term goal of our studies is to permit monitoring of rejection episodes by using these molecular markers as a means of detecting rejection as early as possible posttransplant.

STRUCTURAL ANALYSIS OF AND TRAINING METHODS FOR NEURAL NETWORKS

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We investigated properties of and motion through a multi-layer feed forward neural network designed for solving pattern recognition problems. The usual method of training, known as backpropagation, was utilized and graphical representation of this process was created for demonstration purposes. The backpropagation fails to avoid local minima and so a genetic algorithm, as an alternative training solution, was created to avoid that specific problem. The characteristics of the genetic algorithm were researched for optimum results.

COMPUTATIONAL ANALYSIS OF 2,2´ -DISULFONIC STILBENES

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We determined computationally some characteristics of the binding site of 2,2´ disulfonic stilbenes on the protein band 3, using Sybyl molecular modeling software and HyperChem. R groups attached to the 4,4´ position on the disulfonic stilbenes were nitro, amino, isothiocyano, aceto, azido, and benzamido. The molecules were modeled to minimized energies by using molecular mechanics and MNDO calculations. The energy-minimized molecules were used for gridsearches, molecular dynamics, and superimposing. The superimposed molecules were then used for quantitative structure-activity relationships (QSAR) and comparative molecular field analysis (CoMFA) to examine the steric and electrostatic fields. We concluded that generally the more negative the charge, the greater the binding affinity of the molecule to the binding site. From the steric and electrostatic field analysis, it was concluded that adding more bulk and negative charge around the center of the molecules would increase binding affinity. The torsion angles of lowest energy were dependent upon the length of the molecules.

DETERMINING PREHISTORIC DIETS OF ANKYLOSAURS (ARMORED DINOSAURS) BY EXAMINING THEIR DENTAL MICROWEAR PATTERNS

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Dinosaur teeth, like the teeth of other animals, bear microwear striations owing to abrasion by food items. Different types of food cause different microwear patterns. The dinosaur teeth we are studying are of ankylosaurs from the Kaiparowits Formation (Maastrichtian–latest Cretaceous) of southern Utah. The dinosaur teeth were replicated in an epoxy resin and then prepared for viewing under a scanning electron microscope (SEM). The resulting micrographs, taken at both low and high magnification, are being compared and analyzed to determine what types of food the dinosaurs ate.

OPTIMIZATION OF AN OVERLOAD MECHANISM

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The overload mechanisms that Furnas Electric Company currently produce fail to trip during an in-house performance test at a rate of 1.8%. An improved mechanism should result in a lower cost for the company as well as a more reliable product for the consumer. To improve the mechanism, we collected ones that had failed, established probable causes for their failure, and developed and ran tests to determine which of these were actual causes of failure. We have found the most frequent problem to be a defective triplever. Two possible solutions are either (1) replacing the defective triplevers in overload mechanisms that fail to trip after they are assembled or (2) improving the part so as to reduce failures. We will discuss the practicality of these solutions as well as the problem-solving methods we have used.

GARFIELD FARM AND INN MUSEUM: THE LOCATION AND HISTORICAL SIGNIFICANCES OF ITS FORMER ROADS

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Garfield Farm is an historical living museum recreating the life of 1840s farmers in the Midwest. During the 1840s, the farm supplemented its income by providing lodging for travelers at the junction of the St. Charles-Sycamore and St. Charles-Oregon roads with the Chicago-St. Charles highway. The arrival of railroads in the late 1840s forced the inn out of business. I am attempting to investigate the impact of the roads on the farm and its inhabitants by use of a subsequently published diary written by one of the early family members, along with other sources. By use of secondary sources, I am also investigating how the economy of the farms along the roadways and the growth of Chicago were interdependent with these roads for their success. I am attempting to map the path of one of the roads across the present landscape by using aerial photography supplemented by an 1840 township survey map.

USE OF RAPD MARKERS IN GENETIC MAPPING OF THE PEA PLANT, *Pisum sativum*

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We used Random Amplified Polymorphic DNA (RAPD) markers in order to map the pea plant (*Pisum sativum*) genome. This process uses the polymerase chain reaction (PCR) to amplify random segments of DNA with arbitrary primers. These amplified DNA segments are inherited in a Mendelian fashion, and therefore can be used to construct genetic maps. We began by amplifying extracted DNA from first-generation pea plants in a Thermal Cycler using the PCR method. Then the products of the amplification process were analyzed using a 1.4% agarose gel that was visible under UV light owing to an ethidium bromide stain. This same procedure was repeated for the F_2 generation, which was compared to the parent generation in order to observe band inheritance. Our data collection process went much slower than expected, owing to titration difficulties, deteriorated templates and primers, and adjustments in the running time of gels. As a result, we have insufficient data to allow drawing any conclusions. We have now made adjustments which are intended to allow a speedup of the procedures and to allow conclusions to be drawn as early as this summer.

BABY YOU CAN DRIVE MY CAR: A LOOK AT SAFETY, ENGINEERING, AND MARKETING IN THE AUTOMOBILE'S PAST, PRESENT, AND FUTURE

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We have devised a prototype of the "ideal" car and have developed a marketing strategy for it. We have dealt primarily with automotive safety and its importance to advertising and design. We hypothesize that the marketing and engineering of cars have in recent years become more oriented towards safety rather than performance and style. Such a change would be related to the fact that automobiles are no longer a luxury but have been rapidly becoming a necessity. We show through advertising and design layouts how we have created the "ideal" car for today. We also examine the role that trends have played in shaping consumers' views on style, performance, and safety from the 1950s to the present.

AN ASSAY, CONDUCTED WITH THE HELP OF ELEMENTARY SCHOOL STUDENTS, OF ENVIRONMENTAL LEAD IN RESIDENTIAL AREAS IN THE ROGERS PARK AREA OF CHICAGO

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Various studies have demonstrated the presence of toxic levels of environmental lead in the vicinity of commercial buildings in the Rogers Park area of Chicago. Similar levels have also been found in the environs of housing and schools in various parts of the country, and we predict that this will also prove to be the case in Rogers Park. We have discovered that there are legal complications involved in supplying landlords of small dwellings with the funds necessary for removing lead from the houses they own and that U.S. Senator Carol Mosley Braun's office is interested in creating legislation that would provide the necessary money. In the project we have designed, children from the Rudy Lozanzo School (a public elementary school) in the Rogers Park area of Chicago collected samples of water, soil, and paint chips from around their homes. We will be working with these students at Loyola University in analyzing these samples for lead content by means of polorography, spectophotometry, and graphite furnace. In addition to providing what we anticipate will be valuable environmental information, our work is also intended to expose underprivileged minority students to a more sophisticated type of science experience than is generally to be found in the Chicago public schools and it is hoped that this will increase the students' interest in science.

COCAINE HYDROCHLORIDE ADMINISTERED TO PREGNANT RATS AFFECTS SEXUALLY DIMORPHIC BEHAVIOR OF OFFSPRING

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The sex hormones testosterone and estradiol play an organizational role in the sexually dimorphic growth and development of perinatal rat brains. Administration of cocaine during late pregnancy and/or in early postnatal life can decrease the amounts of testosterone and estradiol that would normally cross the blood-brain barrier and thereby interfere with the development of masculine traits in male rat pups. We have attempted to mimic cocaine abuse in a pregnant human by using gravid female rats, and thereby study the behavioral and physiological implications of the action of the drug, using three cocaine hydrochloride treatment groups. We predicted that partially or completely demasculinized male rat pups would exhibit feminized behavior. We also expected that any abnormalities observed would be most dramatic in the lower dosage groups owing to the blockage of the reuptake of neurotransmitters in the developing neurons of the rat pups. Our data are currently in the process of being analyzed.

PEROXISOME PROLIFERATION AND HEPATOCARCINOGENESIS

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Peroxisomes are organelles in the cell which are involved in purine metabolism. It has been clearly established that when these peroxisomes are proliferated by substances such as hypolipidemic drugs, herbicides, industrial solvents, and phthalate ester plasticizers, they induce hepatocarcinogenesis. While the mechanism by which this hepatocarcinogenesis occurs is not known, it has been hypothesized that it is due to the oxidative stress caused by excess hydrogen peroxide. This oxidative stress occurs because when peroxisomes are proliferated, the H_2O_2-producing fatty acid B-oxidation enzyme system increases several fold, whereas catalase, the enzyme that breaks down H_2O_2, increases minimally. Our analysis of protein gels of livers indicates changes in the liver proteins as the peroxisomes are proliferated, thus providing some insight into the process by which the carcinogenesis occurs. Our sequencing of the frog UOX indicates noteworthy differences–specifically, in the location of the stop codons of the fifth intron–between frog UOX and rat UOX, which can help us further understand the specific mechanism by which the proliferation of urate oxidase in rats leads to hepatocarcinogenesis.

COMPOSITIONAL DIFFERENCES OF THE PATHOGENESIS-RELATED PROTEINS, ß-ENDOGLUCANASE AND CHITINASE, BETWEEN RESISTANT AND SUSCEPTIBLE *Silene alba* IN RESPONSE TO THE PARASITIC SMUT FUNGUS *Ustilago violacea* AND THE RESPONSE PRODUCTION OF PATHOGENESIS-RELATED PROTEIN UPON EXPOSURE OF *Silene alba* TO DIFFERENT LIGHT SPECTRA

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Infection of the plant *Silene alba* by the smut fungus *Ustilago violacea* results in *S. alba* producing and releasing pathogen resistance agents known as pathogenesis-related proteins (PRPs). Because certain strains of *S. alba* show resistance to *U. violacea*, we attempted to determine if either an elevation in the amount of total soluble proteins or a difference in the PRP composition between resistant and susceptible *S. alba* plants is a cause of resistance to the fungus. This was done by measuring total soluble protein in *S. alba* infiltrates and analyzing by gel electrophoresis the PRPs chitinase and ß-endoglucanase. We also examined the effects of growth under greenhouse and growth room conditions on the activity of the PRPs. The results indicate elevated levels of total soluble proteins and more complex PRP compositions in resistant strains and a lower production of some PRPs in *S. alba* under growth room conditions including light from cool-white fluorescent tubes.

INVESTIGATIONS OF BIOMECHANICS OF THE RECTUS FEMORIS MUSCLE AFTER TRANSFER SURGERY

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Stiff-knee gait, a condition characterized by a decreased knee range of motion (ROM), is often found in people who have cerebral palsy or who have suffered a stroke. The rectus femoris, a knee extensor muscle, commonly exhibits abnormal activity, and surgical transfer of this muscle to a site behind the knee has been shown to improve knee ROM during walking. The success of this transfer surgery has been thought to be owing to the muscle being reattached at a location where it can help to flex the knee when the muscle contracts. We have tested this hypothesis. The transferred rectus femoris was electrically stimulated and the forces and moments generated by the contraction were measured. Measurement was by means of a six-degree-of-freedom load cell placed at the ankle. The load cell sends one analog signal containing information about all six DOF to a sampling device which samples and translates the data to give six real time analog signals corresponding to the six degrees of freedom. These signals are then fed through an A/D converter and the data stored on a computer for analysis. Additionally, surface electrodes are placed over the rectus femoris muscle to record the muscle's electric activity. Results thus far show that the transferred muscle does not flex the knee, but instead continues to extend it. Since these findings oppose the original hypothesis, other possible explanations for the surgery's success must be examined.

INVESTIGATION OF A POSSIBLE DISCREPANCY BETWEEN APPARENT AND PREDICTED RATES OF COSMIC RAY EVENTS IN THE FERMILAB CDF DETECTOR

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The data from the CDF colliding beam detector at Fermilab's Tevatron contain certain high energy events (>100 GeV) which deposit all of their energy in the hadronic calorimeters while leaving no tracks in the central tracking chamber or in the electromagnetic calorimeters. We investigate the possibility that these events are the result of interaction between cosmic ray muons and the steel of the detector. Assuming that the energy is deposited through the mechanisms of bremsstrahlung and direct electron-positron pair production, we obtain a prediction, based on theory and previous experimental data, somewhat less than the observed event rate. Further refinement of both the observed rate and the prediction method are required before it can be said whether this discrepancy between theory and observations is significant.

IMSA EXPLORED THROUGH MULTI-MEDIA

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Using computer graphics programs, we have put together, from a student perspective, a video about the Illinois Mathematics and Science Academy (IMSA). We utilize the Omega Toaster almost exclusively to create a multi-media effect with computer graphics. The video combines stock tapes and new footage to describe IMSA to someone who has never been exposed to the school before. We composed background music for the video using a midi-keyboard.

IMPLEMENTATION OF A TRUE VIEWPATHING MECHANISM FOR THE BUILD PROCESS

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The implementation of a true viewpathing mechanism for the build process is currently a problem for large scale software. The notion of viewpathing allows developers to do private development against an official load. Large software projects with many subsystems and source files cannot benefit from such a mechanism, primarily owing to complicated data dependencies. The issues underlying viewpathing are complicated, but a theory can be developed to model the organization of the software and a software viewpathing mechanism to match the organization of the software. In order to deal with the problem, we are currently studying graph algorithms and data structures. We will work toward the development of an algorithm to allow viewpathing in the large scale software currently in use. Implementation of the algorithm will then be utilized to improve the current software build process.

TIMING OF FETAL LOSS OF MURINE MPS VII HOMOZYGOTES

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Murine mucopolysaccharidosis type MPS VII (Murine MPS VII) is an inherited progressive lysosomal storage disease of laboratory mice which is characterized by a deficiency of the lysosomal enzyme, ß-glucuronidase. Murine MPS VII shares many characteristics with human MPS VII (sly syndrome). Unlike human MPS VII, murine MPS VII is on a well-defined genetic background which makes it an excellent model. Previous work with the murine MPS VII model showed that the disease is inherited as an autosomal recessive. Affected animals born from heterozygous parents represent only 18.2% of the newborns, suggesting loss of some MPS VII mice *in utero*. Our work has determined that gus^{mps}/gus^{mps} mice present at 12-13 days of gestation constitute 22.6% of the fetuses. We concluded, therefore, that the loss of MPS VII fetuses probably occurs mostly after 13 days of gestation.

INTERACTIVE VIDEO TUTORIAL ON A PERSONAL COMPUTER

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New multimedia technology and virtual reality machines have created a greater need for user-friendly computer programs. I have developed an interactive computer-generated video tutorial that is easy to learn and to use.

SCHOOLS IN 1890s DU PAGE COUNTY, ILLINOIS

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We are examining the structure and content of the school day and year and the administration of schools in nineteenth century Du Page County, Illinois. We are studying the day-to-day school operation, covering curriculum, the scheduling of school days and terms, and evaluation systems. We are also investigating the building and events surrounding the establishment of the schools, the hiring of teachers, and the use of school funds. Our sources have included published diaries and archival materials such as newspapers of the day, original grade books, original textbooks, school accounts, etc. We are engaged in these activities in order to gather contextual background information for educational programs at a living history museum. Among other phenomena that we have noted was the apparent secondary importance of education as compared to young people being available for farm work and the like (high levels of absenteeism for these reasons), few students continuing on past elementary school, and unselfconscious Christian indoctrination.

DETECTING AND INTERPRETING "SPEECH" PATTERNS IN PHYSIOLOGICAL SYSTEMS

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At both microscopic and macroscopic levels, physiological systems are characterized by rhythms. Ion channels open and close, nerve cells discharge, the heart beats, breaths cycle, and brain waves oscillate. Far from being simple sine waves, however, the rhythms of the body must be very complex and flexible in order to adapt properly to external environmental demands and to internal state changes (*e.g.*, exercise, sleep). In disease, certain rhythms become perturbed, thereby jeopardizing the performance of the organism. Might it be useful to view these rhythms of the body as "speaking" to us? Could there be subtle, yet detectable, alterations in these "speech" patterns–alterations indicative of physiological state changes or pathological distress? To address these questions, this laboratory is uniting mathematical methods from nonlinear dynamics and information theory in order to assess the linguistic quality of physiological signals. Examples from both experimental animals and human recordings illustrate the utility of this instructive viewpoint.

GENDER INFLUENCES IN PHYSICS EDUCATION

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I taught an all-female experimental section of a physics class entitled Calculus-based Physics/Mechanics during the fall semester of the 1993-1994 school year at the Illinois Mathematics and Science Academy in Aurora, Illinois. Data relating to the several research questions of the study are still being analyzed. This report concerns action research done by the investigator during the experiment. I found that the difference in experience base between males and females was easier to detect in the all-female section and that this difference correlated with the response of students to the method of instruction. The results on tests indicated that the all-female class improved in performance relative to the control class during the semester, but that the improvement did not carry over to the final exam. There is anecdotal evidence that supports the development of an unusual level of physical insight in some students in the experimental section.

LIPOFUSCIN AROUND THE BLOOD VESSELS OF THE WHITE MATTER OF THE LEFT FRONTAL LOBE OF THE BRAIN AND ITS CORRELATION WITH AILMENTS

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We examined blood vessels of the left frontal white matter for the presence of what has always been assumed to be hemosiderin in order to ascertain relationships, if any, between the amount of supposed hemosiderin and various ailments. Stained slides from *ca.* 100 individual cases from 1991 were examined microscopically. The ages of those included in the group examined ranged from newborn to 87, and the causes of death were AIDS, cancer, respiratory diseases, etc. If what was taken to be hemosiderin in the form of yellowish brown globules was detected, then the slide was marked positive and rated according to an "iron scale" of 1+, 2+, 3+, and 4+. Frontal white matters of newborns and very young children contained no apparent hemosiderin around the blood vessels. All adults registered at least 1+ on the iron scale. When the brain samples were stained to confirm the presence of iron, the results were negative. This is noteworthy because previous researchers have always assumed that the brown pigments were, in fact, hemosiderin. We hypothesized that the brown pigments were actually lipid-containing pigments termed lipofuscin. The stain tests for lipofuscin were performed on the brain samples, and the results were positive.
